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946,351

PATENT SPECIFICATION

DRAWINGS ATTACHED

946,351

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COMPLETE SPECIFICATION

Improvements in or relating to Electrical Transformers and Induction Coils and to Mounting Arrangements therefor

We, AUTOMATIC TELEPHONE & ELECTRIC COMPANY LIMITED of Strowger Works, Liverpool 7, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to improvements in induction coils or the like and to mounting arrangements for such devices.

Although the invention is applicable to so-called induction coils for use in subscribers' telephone instruments, it is not necessarily limited thereto.

As disclosed in The Post Office Electrical Engineers' Journal, Vol. 52 Part 1 of April 1959 pages 1 to 12, the subscriber's telephone instrument No. 706, of the British Post Office incorporates the induction coil No. 31. This involves a suitably wound bobbin of moulded plastic material embracing one limb of a rectangular ferrous core formed from substantially "U" shaped laminations which have their ends interlaced in known manner. This interlacing is a relatively laborious operation. Moreover the laminations which are manufactured in large quantities vary considerably in thickness and this requires that they be sorted into batches so that the laminations for each transformer are of approximately the same thickness, otherwise the production difficulties are again increased.

In addition, the nature of the material used for the laminations is such that the press tools used in their manufacture are subject to appreciable wear and under these circumstances burrs may be produced at the edges of the laminations. The presence of such burrs has the effect of increasing the spacing between laminations so that a core using these laminations and built to a thickness determined by the close tolerance dimensions of the tunnel in the bobbin, would have less iron in it than a core made from unburred laminations. It follows that the use of burred laminations, in addition to increasing assembly difficulties, might well result in induction coils not meeting the necessary electrical acceptance requirements.

However the use of a rectangular core in the induction coil No. 31 enables the device to be mounted upon the upper face of the base of the No. 706 instrument in a simple manner. For this purpose the base, which is of plastic moulded material, is provided with an integral housing dimensioned to snugly accommodate the foot of the core. A detachable springy metal clip is arranged at its lower end to interlock with a slot in the moulding and at its upper end to embrace an upper exposed square corner of the core so that the coil is securely held in position.

As an alternative to the stack laminated type of construction of cores in transformers and induction coils, it is well known to use a pair of so called "C-cores" having their extremities in abutment. In producing these cores a ferrous metal tape is wound on a mandrel of, say, rectangular cross-section, the convolutions being one on top of the other and suitably bonded together by electrically insulating material. The final rigid structure is then cut at the midpoint of opposite limbs to provide two C-cores. This method of transformer core production has the advantage that "blanking" waste incurred in the production of conventional laminations is avoided. Also since the tape is manufactured free from burrs and can be wound accurately to a prescribed depth, it follows that cores of consistent quality magnetically can be produced in bulk manufacture. Furthermore the magnetic properties of the individual C-cores can be checked prior to inclusion in the transformer or induction coil. If the wound bobbin is also tested as a separate item, transformers or the like within

[*Price 4s. 6d.*]

the specified operational limits are readily obtained when the cores are introduced to the assembly. In the complete assembly, the two C-cores are usually secured together and in relation to the bobbin by a so-called "banding strip" of suitable metal, e.g. stainless steel, which tightly embraces the cores and has its ends jointed by locking means.

By using tape, e.g. silicon iron, with lengthwise grain orientation in the manufacture of C-cores, full advantage is made of the grain orientation so that some reduction in the quantity of iron in a transformer or induction coil may ensue.

However, it is inevitable in the manufacture of C-cores, as described, that the winding operation produces rounded external corners. Therefore in using such cores in the induction coil No. 31 of the No. 706 telephone instrument, difficulties arise in the securing of the induction coil to the instrument base. It is essential that these difficulties are overcome if induction coils using C-cores are to be completely interchangeable with induction coils of the existing design.

Therefore one object of the present invention is to provide an induction coil using C-cores which gives this facility.

Another object of the invention is to provide an induction coil using C-cores with such constructional features as will enable it to be secured by clip means to a mounting plate.

According to one feature of the invention, in an electrical induction coil or the like having a pair of C-shaped sections secured by means of a bonding strip or wire with their extremities in abutting relationship to form a closed core on which a winding or windings is or are mounted, a non-magnetic member has a first arm for engagement with the outer surfaces of one limb of the core and a second arm substantially perpendicular to said first arm for engagement with the outer surface of a second limb adjacent to said one limb, the arm engaging the outer surface of the core limb which includes the abutting surfaces of the C-shaped sections being provided with tongues perpendicular thereto, which tongues embrace the limb on both sides of the abutment plane and the junction of said arms is formed by a nose portion extending outwardly from the core.

According to another feature of the invention, in a mounting arrangement for an induction coil or the like having a pair of C-shaped sections secured by means of a bonding strip or wire with their extremities in abutting relationship to form a closed core on which a winding or windings is or are mounted and arranged to seat within a housing provided on a mounting plate, a non-magnetic member has a first arm for engagement with the outer surfaces of one limb of the core and a second arm substantially perpendicular to said first arm for engagement with the outer surface of a second limb adjacent to said one limb, the arm engaging the outer surface of the core limb which includes the abutting surfaces of the C-shaped sections being provided with tongues perpendicular thereto, which tongues embrace the limb on both sides of an abutment plane and the junction of said arms is formed by a nose portion extending outwardly from the core and adapted to be engaged by a spring clip secured to the base plate, the engagement between said clip and said nose portion serving to retain the induction coil within the housing.

The invention will be better understood from the following description of the preferred method of carrying it into effect which should be read in conjunction with the drawings accompanying the provisional specification comprising Figs. 1 and 2.

Of the drawings:

Fig. 1 shows an exploded view of a telephone-instrument induction coil and its allied mounting arrangements, and

Fig. 2 shows a side view (partly in section) of all those components illustrated in Fig. 1 but in assembled relationship.

In the drawings many of the items represented are identical with those of the induction coil employed in the standard telephone instrument No. 706 of the B.P.O. This applies to the wound bobbin 10 of moulded plastic material, to the housing 14 formed integrally with the moulded-plastic base 16 (partly shown) of the instrument, and to the springy metal retaining clip 18. The bobbin, having a rectangular-section axial tunnel 12 and terminal tags such as 13 emerging from its upper end cheek, is provided with suitable windings over the portion 11. The housing comprises a walled cavity 15 having a higher walled portion towards the left to embrace part of the left-hand limb of the magnetic core. The housing is also provided with a recess 17 which joins a passage extending beneath the left-hand end wall of said housing, and is adapted to take the foot 19 of the retaining clip 18. The retaining clip, of say nickel silver, has an upwardly extending bowed portion substantially at right angles to the foot, and its upper extremity takes the form of a substantially horizontal tongue 20 which is to exert a downward pressure upon the coil assembly, to retain it in position in the housing. Immediately below said tongue, the clip is provided with two lugs, such as 21 which are so spaced that they will prevent excessive lateral movement of the coil assembly.

The magnetic core comprises two C-sections 22 and 23 manufactured along the lines already described. An attachment 24, which is an important item in respect of the invention, is formed from sheet brass and is provided with an upper pair of tongues such as 25 and a similar lower pair of tongues such as 26. These pairs of tongues are so spaced as to

neatly embrace respectively the upper and lower C-cores which meet at points 27. This arrangement prevents lateral displacement of the cores. The attachment includes an upper horizontal limb which is provided with a slot 28. At the junction of the vertical and horizontal limbs of the attachment there is formed a nose-portion 29 which can be equated to a square corner provided on the rectangular laminated core hitherto employed and which is utilized in conjunction with clip 18 for the retention of the induction coil. Immediately below nose 29 there is a second slot 30 which, like slot 28, allows the metal banding tape 31 (preferably of stainless steel) to pass through the attachment.

The banding strip, through the intermediary of the attachment 24 is used for securing the identical C-cores together in relation to the bobbin. The arrangement can be seen clearly in Fig. 2 wherein the bobbin is represented by broken lines and the housing is shown in cross-section for simplicity. It will be noted that one end of the banding strip is passed through slot 28 of the attachment and formed to a hook, which is trapped against the core. With one limb of each C-section threaded into the tunnel of the bobbin, the strip passes around the two-part core about which the attachment 24 is located. The remaining end of the banding strip is passed through the second slot 30 and is tightened by a suitable hand tool. This hand tool comprises a metal rod with a slotted end, and the tightening is effected by placing its slot over the end of the strip and rotating in a clockwise direction. During this process the strip is stretched slightly within its elastic limits so that the two C-cores are drawn into intimate engagement. With the strip so tightened it is soldered to the attachment, for instance in the vicinity of slot 30. The configuration of the end of the strip after the tightening operation is such that it imparts a locking action to the strip but even so it is considered desirable to provide the added security of soldering.

Fig. 2 illustrates the method of mounting the induction coil. Thus with lower C-core nesting in the housing of the instrument base 16, the lower cheek of the bobbin abuts the lower wall portion, and with the foot 19 of the retaining clip 18 entered into slot 17 the clip is sprung into position as shown, so that it adequately secures the induction coil. If desired, in order positively to prevent tilting of the induction coil under the action of the retaining spring 18, a steel strip may be soldered to the banding strip after the latter is tensioned, the steel strip having a length substantially equal to the width of the core and being soldered to the banding strip where the latter passes round the lowest portion of the core so that the ends of the strip engage with or are in close proximity to the inner surfaces of the higher and lower walled portions of the housing 14.

A device as described, with its nosed attachment, is interchangeable with the B.P.O. No. 31 induction coil as regards the mounting arrangements.

WHAT WE CLAIM IS:—

1. An electrical induction coil or the like having a pair of C-shaped sections secured by means of a bonding strip or wire with their extremities in abutting relationship to form a closed core on which a winding or windings is or are mounted, wherein a non-magnetic member has a first arm for engagement with the outer surfaces of one limb of the core and a second arm substantially perpendicular to said first arm for engagement with the outer surface of a second limb adjacent to said one limb, the arm engaging the outer surface of the core limb which includes the abutting surfaces of the C-shaped sections being provided with tongues perpendicular thereto, which tongues embrace the limb on both sides of the abutment plane and the junction of said arms is formed by a nose portion extending outwardly from the core.

2. A mounting arrangement for an induction coil or the like having a pair of C-shaped sections secured by means of a bonding strip or wire with their extremities in abutting relationship to form a closed core on which a winding or windings is or are mounted and arranged to seat within a housing provided on a mounting plate, wherein a non-magnetic member has a first arm for engagement with the outer surfaces of one limb of the core and a second arm substantially perpendicular to said first arm for engagement with the outer surface of a second limb adjacent to said one limb, the arm engaging the outer surface of the core limb which includes the abutting surfaces of the C-shaped sections being provided with tongues perpendicular thereto, which tongues embrace the limb on both sides of an abutment plane and the junction of said arms is formed by a nose portion extending outwardly from the core and adapted to be engaged by a spring clip secured to the base plate, the engagement between said clip and said nose portion serving to retain the induction coil within the housing.

3. An electrical coil as claimed in claim 1, wherein said nose portion is provided with two slots for the reception of the two ends of the bonding strip or wire, one end of which is held between a core limb and the engaging arm while the other end is secured by soldering to the nose portion after the strip or wire has been tightened.

4. A mounting arrangement for an electrical induction coil as claimed in claim 2, wherein a metal plate is secured to the bonding strip where the latter passes round the end of the core which is within the housing, the plate

having a dimension such that it engages with or is in close proximity to the inner surfaces of opposite walls of the housing.

5. An electrical induction coil or the like and a mounting arrangement therefor substantially as described with reference to the drawings accompanying the provisional specification.

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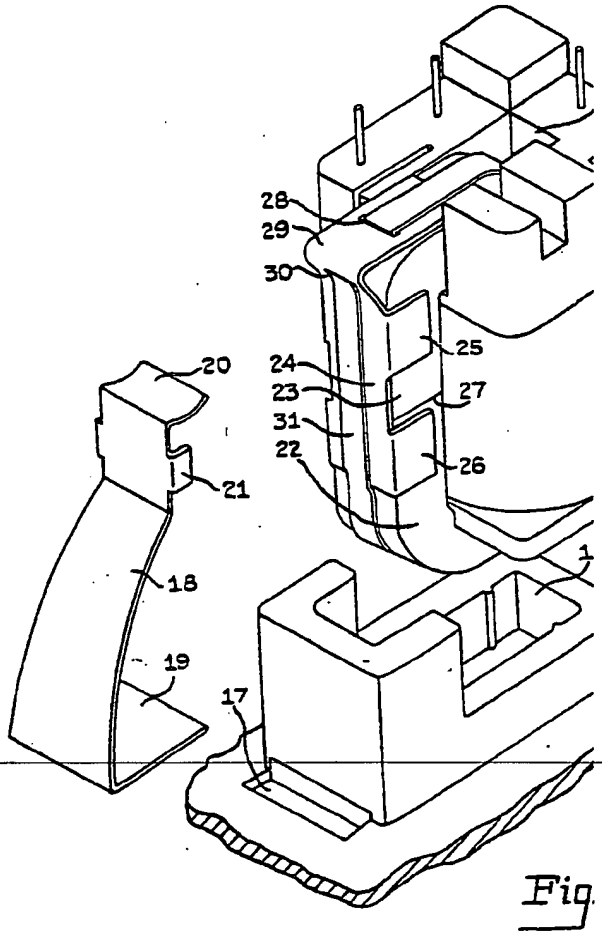

Fig.

946351 PROVISIONAL SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 1 & 2

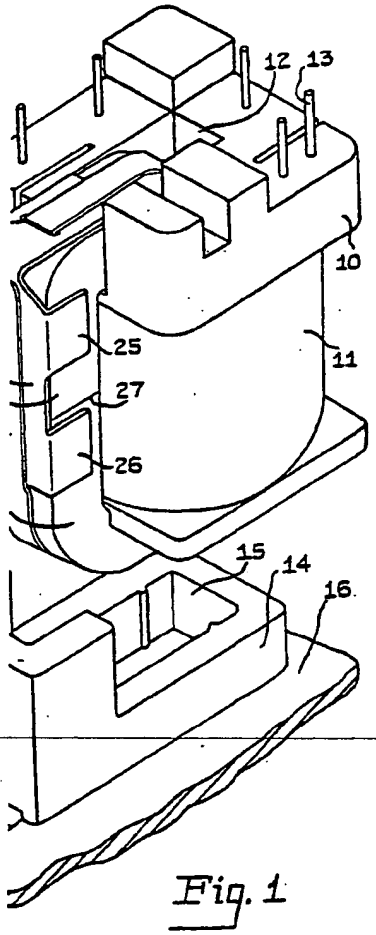

Fig. 1

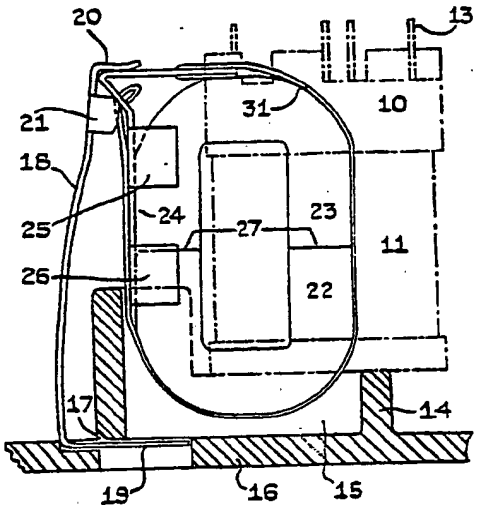

Fig. 2

946351 PROVISIONAL SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 1 & 2

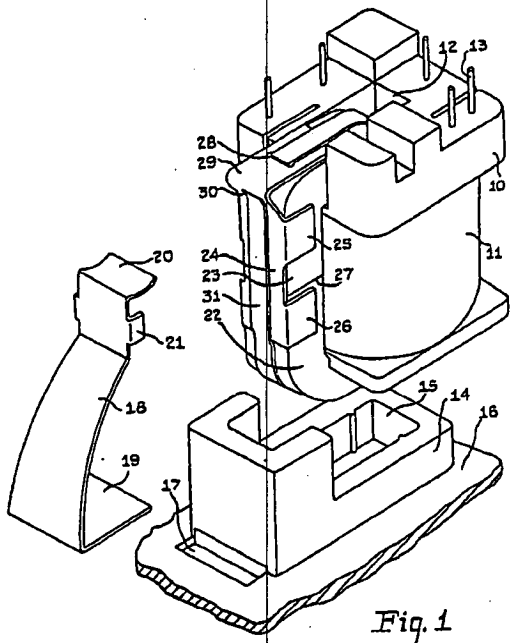

Fig. 1

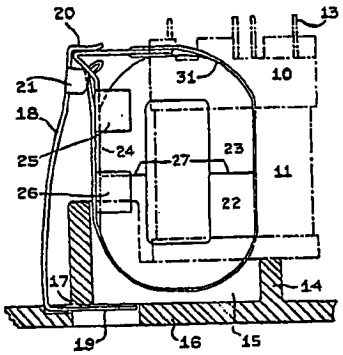

Fig. 2